

No such connection appears in the annual means for Mount Weather, but in winter the coefficient between P_0 and T_0 is -0.41 . These figures confirm the conclusions already given, viz., that in the United States, particularly in the interior portions, wind direction exerts a greater influence on the air temperatures than does the sea level pressure.

THE ORIGIN OF ANTICYCLONES AND DEPRESSIONS.

By Lieut. JOHN LOGIE.

[Abstracted from Proceedings Royal Society, Edinburgh, 1918, vol. 39, pp. 56-77.]

The essential feature of this theory is "that the chief cause of depressions and anticyclones is to be sought

¹ cf. abstract, Sci. Abs., Aug. 31, 1919, p. 361.

GENERAL MOVEMENTS OF THE ATMOSPHERE.

(Discussion.)

In a recent paper¹ H. H. Hildebrandsson has presented the results of an exhaustive study of all available information on the subject of free air wind conditions. This information is based on observations of cloud and volcanic dust movement and on those with kites, pilot and sounding balloons. From the study are drawn certain conclusions, sweeping in character, which appear to be well founded, providing we can accept the data on which they are based as representative of all conditions. They are not representative, however, and the conclusions, at any rate some of them, are therefore not final. Particularly is this true of the conclusion No. 7, which reads: " * * * a direct upper current from the Equator to the poles does not exist, nor a lower current in the opposite direction from the poles to the Equator."

Most unfortunately neither upper clouds nor free balloons can be observed as a rule during conditions in which a southerly component in the upper winds is to be expected because of the existence of low clouds and generally stormy weather. That is to say, when a cyclone is approaching or is passing to the north of a station, upper winds are strong and have a decided southerly component. This condition is found when observations can be made with a cyclone in that position, as is well shown, for example, in figures 41 and 43 of Cave's "The Structure of the Atmosphere in Clear Weather." But in most cases such observations can not be made in the eastern half of a cyclone because of low clouds. The same thing is true of northeasterly and easterly surface winds under the influence of a cyclone approaching from the southwest with an anticyclone to the north or northwest, as shown in figure 47 and discussed on pages 6 and 78 of Cave's work. See also, in this connection, "Rules" 1, 2, and 4 in "The turning of the winds with altitude," MONTHLY WEATHER REVIEW, January, 1918, p. 21. Under such conditions kites can not be flown owing to the existence of a calm stratum between the surface easterly and the upper southwesterly wind, nor can balloons or upper clouds be observed, because of rainy weather or at least dense cloudiness in the lower layers. It follows, then, that undue weight is given to the observations made in the western half of cyclones where a northerly component in the upper winds is to be expected and is usually observed. Yet we find that even when the greater weight is given to observations in the western half of cyclones, still the resultant wind is almost exactly

in the phenomenon of *radiation*; * * * that cyclones are caused by *cooling*, and anticyclones by *heating* of the air."

That temperature changes lead in turn to pressure changes is, of course, well known; hence, much of the argument in this paper is new only in form. It is also known that clouds modify the effects of insolation in the manner claimed.

The paper is well worth reading for it deals, in the language of thermodynamics, with a contributing factor (and in our opinion only a factor) in the production of cyclones and anticyclones; a problem full of difficulties, and whose solution is urgently needed.—W. J. H.

westerly. What would happen if representative observations could be obtained in all parts of cyclones and anticyclones? Most certainly we should find a resultant westerly wind with a small southerly component, probably so small that it would be shown only by the mean of a very large number of observations—observations which unfortunately can not be made, at least with present methods, for the reasons already given.

Practically no free air observations have been made at sea in middle latitudes, the one region where the planetary circulation should find greatest opportunity for unrestricted development. Conditions here can be judged only from the movements of cyclones. These as a rule travel east-northeastward, and it is generally recognized that on the average they follow the direction of the upper winds. Unless we consider conditions in all parts of the temperate zones, we can draw no final conclusions.

From theoretical considerations it is certainly to be supposed that the prevailing westerlies have in the mean a slight southerly component. As is well known the latitudinal pressure variation at intermediate altitudes, i. e., 5 to 15 kilometers consists of a decrease from the tropics toward the polar regions. The corresponding temperature change is very small, with the result that the air density also decreases poleward. Under ideal conditions the resulting wind would be exactly parallel with the isobars, i. e., west to east. But conditions are never ideal in any part of the atmosphere. At the surface, where friction and other retarding effects are most in evidence, the departure from a gradient wind is exceedingly large. At the higher levels these effects, which include friction, turbulence and viscosity, disappear to a considerable extent, but most assuredly not altogether. If they are still present (and it must be admitted that they are) then the winds must necessarily make a small angle with the isobars, i. e., the prevailing westerlies at those levels have a slight southerly component.

How does this air return equatorward? In all probability practically all of it does so in the lower 5 kilometers. Here we find a latitudinal variation in pressure and temperature such that the air density decreases from north to south, a condition that favors a slight northerly component on the average in the winds at these levels. The actual transfer is accomplished for the most part in the movements of anticyclones from north to south, especially over the continents. In a relatively short time as much air can be carried southward in this way as is carried northward at higher altitudes in a much longer time, owing to the greater density in the former than in the

¹ Results of some empiric researches as to the general movements of the atmosphere. Translation by W. W. Reed. MONTHLY WEATHER REVIEW, June, 1919, 47, pp. 374-389.

latter case. It is important to note in this connection that mass movement, or at any rate wind resultants, rather than relative frequency of different directions should be made the basis of a study of planetary circulation. Cloud observations in general give direction only and do not therefore give us conclusive results. Added to this is the impossibility, as already stated, of observing wind conditions in the higher strata when low clouds are present.—*W. R. Gregg.*

SUPERPOSITION OF AERIAL CURRENTS IN THE PENINSULA OF CAPE VERDE, SENEGAL.

By H. HUBERT.

[Comptes Rendus, 168, pp. 99-102, Jan. 13, 1919.]

In the interior of western Africa, the normal fall of air temperature with increase of altitude occurs, whether the surface wind is the monsoon or the harmattan, but on the

Senegal coast this rule is not followed when the trade wind blows. Observations made there in a hydroplane during October and November, 1918, show that temperature increases with height, either from ground level or from a height up to about 100 meters, until a maximum is reached between 500 and 600 meters, which may be as much as 6° C. above the temperature at ground level. As height still further increases the normal fall of temperature again sets in, so that ground temperatures are again met with at heights of 1,000 to 1,300 meters. Relative humidity near the ground is high, but falls rapidly at about 200 meters, and reaches a minimum where the temperature shows a maximum.

The observations are explained by the superposition in this season of the dry and hot harmattan east wind above the humid, cool, northerly trade-wind, the plane of contact being below 500 meters. It is always possible, however, for the harmattan to descend to the surface, and entirely displace the trade-wind in these months.—*Science Abstracts*, 3, 1919, p. 150.

ABSTRACTS, REVIEWS, AND NOTES.

AMERICAN METEOROLOGICAL SOCIETY.

An American meteorological society will probably be formally organized at St. Louis, December 29. (*Science*, Aug. 22, 1919.) Strange as it may seem, considering the fact that our national weather service was organized half a century ago, there has never been a national meteorological society. According to a recent circular, the project is being received with considerable enthusiasm and several hundred people have indicated their desire to join. The objects stated are:

The advancement and diffusion of the knowledge of meteorology and climatology, and the broadening of their applications in public health, agriculture, engineering, aeronautics, industry, and commerce.

To accomplish these aims, membership in the society has been thrown open to all who may be interested; yet provisions planned for the election of eminent meteorologists as fellows will insure its standing as a scientific society. Its membership field is the Western Hemisphere, and its hope is cooperation which will bring together the producer, the teacher, and the user of meteorological knowledge. It is stated that no attempt will be made at the outset to launch a new meteorological publication—only a monthly leaflet of news, notes, queries, etc., is contemplated.—*C. F. B.*

INTERDEPARTMENTAL BOARD ON METEOROLOGY.

The important benefits resulting from the application of meteorological principles in the direction and control of navigation of the air, as also major artillery and other military and naval operations, has led to certain kinds of meteorological work becoming a more or less permanent activity of the War and Navy Departments. This has resulted in numerous informal conferences between representatives of the Weather Bureau and the other departments, and the whole subject has finally been recognized as of such importance as to justify the organization of a more or less permanent interdepartmental board selected to discuss and consider the relative needs of the departments and the arrangement of cooperation and coordination of work to accomplish these results in the most economical and advantageous fashion and in a manner to avoid unnecessary duplication. The board was created by the Secretary of War, acting for and by direction of the President, and is as follows:

I hereby appoint a board to consider the question of the collection and dissemination of meteorological data and to make recommendations:

Lieut. Col. Horace Hickam, Air Service.
Lieut. Col. W. R. Blair, Signal Corps.
Lieut. Tunis A. M. Craven, U. S. Navy.
Lieut. (junior grade) C. N. Keyser, U. S. Navy.
Prof. Charles F. Marvin, Chief of Weather Bureau.
Mr. R. H. Weightman, Meteorologist, Weather Bureau.

The order further designates Prof. Charles F. Marvin as chairman of the board and provides that meetings shall be held at the office of the Chief of the Weather Bureau and other places at such times as may be designated by the chairman.

But few meetings of the board have been held as yet, but it is obvious that an interdepartmental agency of this character provides for the most effective coordination and cooperation between the departments interested. It is probable, also, that other departments of the Government that are interested in flying, as the Post Office Department, for example, may be requested to designate representatives.

It is expected that important provisions will be made for the enlargement of the meteorological work of the Bureau in the interest of civil and military aeronautics.—*Weather Bureau Topics and Personnel*, Sept., 1919.

UNIFICATION OF THE BRITISH METEOROLOGICAL SERVICES.

By LIEUT. COL. E. GOLD.

[Extracts from Symons's Meteorological Magazine, September, 1919, pp. 86-88.]

A famous general of the Flying Corps once remarked that, whatever may have been his opinion about the policy of the allied supreme command, he was fully convinced that a single meteorological service was the correct policy for the Western Front. Full interallied meteorological unity was never indeed achieved but there was, in the field, a national unity in favorable contrast with the trinities in Paris and London; and there was the closest cooperation between the French, British, and American military meteorological services.

With the end of the war the movement for unity gained power, and now, at last, the British Isles have one meteorological service with an establishment or personnel and equipment more in accordance with the importance of the